Clean Vehicle Rebate Project Long Term Planning:
Funding Needs for Fiscal Years 2016–2017 thru 2018–2019

by the Center for Sustainable Energy[1]
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Overview

The following assesses, primarily through extrapolation of real-world data, the funding requirements for the Clean Vehicle Rebate Project (CVRP) for fiscal year 2016–2017 (FY 16–17) thru FY 18–19. These forecasts are meant to inform the Air Resources Board's Innovative Light-Duty Strategies Section (ILDSS) as it engages with stakeholders in long-term planning for the program, per requirements of SB 1275. They are not meant to represent the view of the Air Resources Board (ARB) or to predict the future of clean-vehicle markets, but rather provide a specific starting point for the discussion between ILDSS and CVRP stakeholders about program funding needs.

Approach

Data. The scenarios described herein extrapolate real-world data to forecast future sales/lease volumes of plug-in hybrid electric vehicles (PHEVs), range-extended battery electric (BEVx) vehicles, all-battery electric vehicles (BEVs) and "Other" eligible vehicles (neighborhood electric vehicles and zero-emission motorcycles). Real-world data is inadequate to forecast future volumes of fuel-cell electric vehicles (FCEVs), for which an alternative approach was taken (described below).

Extrapolated real-world data for each technology type consists of:

1. **vehicle registration data** (covering March 2010 thru May 2015 for PHEVs, BEVx vehicles, and BEVs), and
2. **rebate data** (covering June 2015 thru November 2015 for PHEVs, BEVx vehicles, and BEVs, and covering March 2010 thru November 2015 for Other vehicles).

Rebate data is made to represent the market only where registration data is currently not available (e.g., June 2015 thru November 2015). This is done by multiplying the number of rebates by a "market multiplier." The market multiplier is the inverse of the historical ratio of rebated vehicles to all vehicle registrations of a given technology type. It produces a market estimate based on the proportion of the market that rebates are assumed to represent. This is done separately for PHEVs, BEVx vehicles, BEVs, and Other vehicles.

[1] For more information, contact brett.williams@energycenter.org. Recommended citation: Williams, Brett and Anderson, John (2016), "Clean Vehicle Rebate Project Long Term Planning: Funding Needs for Fiscal Years 2016–2017 thru 2018–2019," Center for Sustainable Energy, San Diego CA, February. Thanks also to Clair Johnson, Ria Langheim, Dylan Petersen, and Colin Santulli.

Extrapolation method. Using the real-world data, extrapolations were created for each technology type (PHEV, BEVx, BEV, and Other each separately calculated). All scenarios explored here use linear extrapolation. (Polynomial extrapolations were also examined, but produce unrealistic trends within the timeframe examined.) Linear extrapolation has proved the most accurate method to make short-term funding-availability calculations over the last year. However, there is no guarantee that this will continue to be the case, and the farther out into the future vehicle sales/lease volumes are examined, the less realistic the extrapolations become. Nevertheless, linear extrapolations are relatively straightforward to understand and discuss, making them amongst the more transparent approaches. Combined with their recent historical accuracy, it is believed they are a reasonable starting point for the stakeholder discussion.

FCEV and Other forecasts. Due to poor-quality registration data and the small quantity of rebate data for FCEVs (136 rebates to date), an alternative approach is required for this technology type. Data drawn from a 2011 ZEV regulation compliance scenario were determined to be the most consistent with recent auto manufacturer announcements, amongst the relatively limited available data options. The impact of FCEVs in the scenarios below is relatively modest compared to that of PHEVs and BEVs in the examined timeframe. However, utilizing the 2011 ZEV compliance scenario FCEV volumes allows the exploration to represent them in a reasonable manner.

No such alternative data were available for Other vehicles. Therefore, rebate data for Other vehicles and the market multiplier for BEVs were used to represent the market for Other vehicles from March 2010 thru November 2015. This allowed the creation of a modest linear extrapolation. It is likely this extrapolation, due to the small quantity of historical rebates for Other vehicles, underestimates the expected future demand. However, the impact of Other vehicles on funding requirements is expected to be even smaller than FCEVs, particularly given the small assumed rebate amount ($900).

Assessment of funding requirements. Rebate funding demand is calculated by multiplying the forecasted vehicle volumes (representing the entire market for each technology type) by two factors: 1) a "Program Percentage," the historical percentage of vehicles of a given technology type that are rebated, and 2) the rebate amount for that technology type. The rebate amounts are shown in Table 1. Program funding requirements include both rebate funding requirements and administrative costs equivalent to historical levels.

Table 1. Rebate amounts

Technology type	Rebate amount assumed
BEV	$2,500
PHEV	$1,500
FCEV	$5,000
Other	$900

Results

Baseline 1.1. Table 2 summarizes the results of applying the approach described above to produce a baseline scenario for discussion. Table 2 provides: 1) the number of new vehicles registered, 2) the number of vehicle rebates, and 3) the program funding requirements—all for the period FY 16–17 thru FY 18–19. The sensitivity of these baseline results to various assumptions is explored below.

This scenario has been given the name Baseline 1.1 to reflect the difference between the baseline results described here and the Baseline scenario used in the ARB handout for the 27 January 2016 workshop, "Clean Vehicle Rebate Project (CVRP), SB1275: 3 Year Funding Forecasts." Namely, the difference is that BEVx vehicles have been extrapolated separately in Baseline 1.1 in this document, in order to more fully enable their unique characterization (as a battery-dominant type of PHEV that receives a BEV-level rebate). Doing so increased the funding requirement over the time period examined by 5% (i.e., Baseline 1.1 three-year funding = 105% of Baseline three-year funding).

Table 2. Baseline 1.1 impacts, FY 16–17 thru FY 18–19

New vehicle registrations	352 k
Vehicles rebated	241 k
Program funding requirement	$555 M

k=thousand, M=million

Sensitivity scenarios. Table 3 presents additional scenarios to illustrate the sensitivity of the funding-requirement estimate to various assumptions. Each is described in turn.

Table 3. Sensitivity of the FY 16–17 thru FY 18–19 funding requirement

#	Scenario	FY 16–17 (M)	FY 17–18 (M)	FY 18–19 (M)	3-year (M)	% of Baseline 1.1
1	Baseline 1.1	$157	$183	$215	$555	100%
2	36-month extrapolation	$151	$174	$203	$528	95%
3	12-month extrapolation	$128	$138	$155	$421	76%
4	Historical low Program Percentages	$123	$143	$169	$436	79%
5	–10 Program Percentage points	$134	$156	$184	$475	86%
6	+10 Program Percentage points	$179	$209	$246	$634	114%
7	Historical high Program Percentages	$192	$224	$264	$681	123%
8	30% PHEV / 70% BEV	$157	$183	$212	$552	100%
9	60% PHEV / 40% BEV	$135	$158	$183	$477	86%
10	Extreme low combination	$88	$96	$107	$290	52%
11	Extreme high combination	$194	$227	$263	$683	123%
12	Income criteria	$155	$180	$212	$547	99%
13	Income criteria +25% additional LMI	$161	$188	$221	$571	103%
14	Income criteria +50% additional LMI	$168	$196	$231	$594	107%

M=million

- **Baseline 1.1.** Scenario 1 is the baseline scenario, which uses life-of-project data, Program Percentages based on historical averages by technology type, and no income criteria.
- **Range of data used.** Scenarios 2–3 and Figure 1 show the effect of changing the range of the data used to formulate the extrapolations. Scenario 2 uses only the most recent 36 months of data and scenario 3 uses only the most recent 12 months.
- **Program Percentage.** Scenarios 4–7 and Figure 2 illustrate the effect of changing the assumed Program Percentages. Scenario 4 uses historical quarterly lows for each technology type and scenario 7 uses historical quarterly highs. Scenario 5 uses -10 Program Percentage points, and scenario 6 uses +10 Program Percentage points. In summary, the Program Percentages are:
    - Baseline 1.1 (scenario 1): 62% for PHEVs and 80% for BEVs
    - Historical low Program Percentages (scenario 4): 51% for PHEVs and 63% for BEVs
    - -10 Program Percentage points (scenario 5): 52% for PHEVs and 70% for BEVs
    - +10 Program Percentage points (scenario 6): 72% for PHEVs and 90% for BEVs
    - Historical high Program Percentages (scenario 7): 80% for PHEVs and 95% for BEVs
- **Technology type mix.** Scenarios 8–9 explore the effect of funding a total number of rebates equivalent to Baseline 1.1, but at differing percentages of PHEV rebates relative to BEV rebates. For reference, the Baseline 1.1 scenario produces nearly 241,000 (241 k) rebates, 37% of which are for PHEVs, 6% for BEVx vehicles, 54% for BEVs, 3% for FCEVs, and 0.1% for Other vehicles. Further, the historical California market mix (thru May 2015) is approximately 50% PHEVs and 50% BEVs, whereas the historical rebate mix is approximately 40% PHEVs and 60% BEVs.
    - Scenario 7 assigns 30% of the 241 k rebates to PHEVs and 70% to BEVs
    - Scenario 8 assigns 60% of the rebates to PHEVs and 40% to BEVs.
- **Extreme high and low combinations.** Scenarios 10–11 illustrate the effect of simultaneously utilizing input assumptions (data-scope, Program-Percentages, and vehicle-mix) that individually produce the lowest (or highest) funding requirement. *These are not realistic scenarios*, but rather illustrate the extreme effects of all factors lining up in one direction or the other.
    - The “Combined Low” scenario (scenario 10) uses the most recent 12 months of data, historical quarterly low Program Percentages for each technology type, and a 60%/40% PHEV-to-BEV ratio.
    - The “Combined High” scenario (scenario 11) uses life-of-project data, historical quarterly high Program Percentages for each technology type, and a 30%/70% PHEV-to-BEV ratio.
- **Income criteria.** Scenario 12 gives an indication of the possible effect of the new income criteria being implemented in 2016. It does this by excluding the historical percentage of participants who would have fallen above the income cap and by increasing the rebate amount by $1,500 for the historical percentage of participants who would have qualified for the increased rebate for low-to-moderate income (LMI) consumers. (This requires assumptions based on tax-filing-status and household-size data.) It does not account for the effect of increased participation in the program due to the increased rebate amount available. Scenario 13 accounts for this market effect by increasing the number of eligible LMI consumers by 25% relative to historical levels. Scenario 14 uses a 50% increase. Scenarios 12–14 are depicted in Figure 3.

Figure 1: Sensitivity of the Baseline (1.1) to Data Range

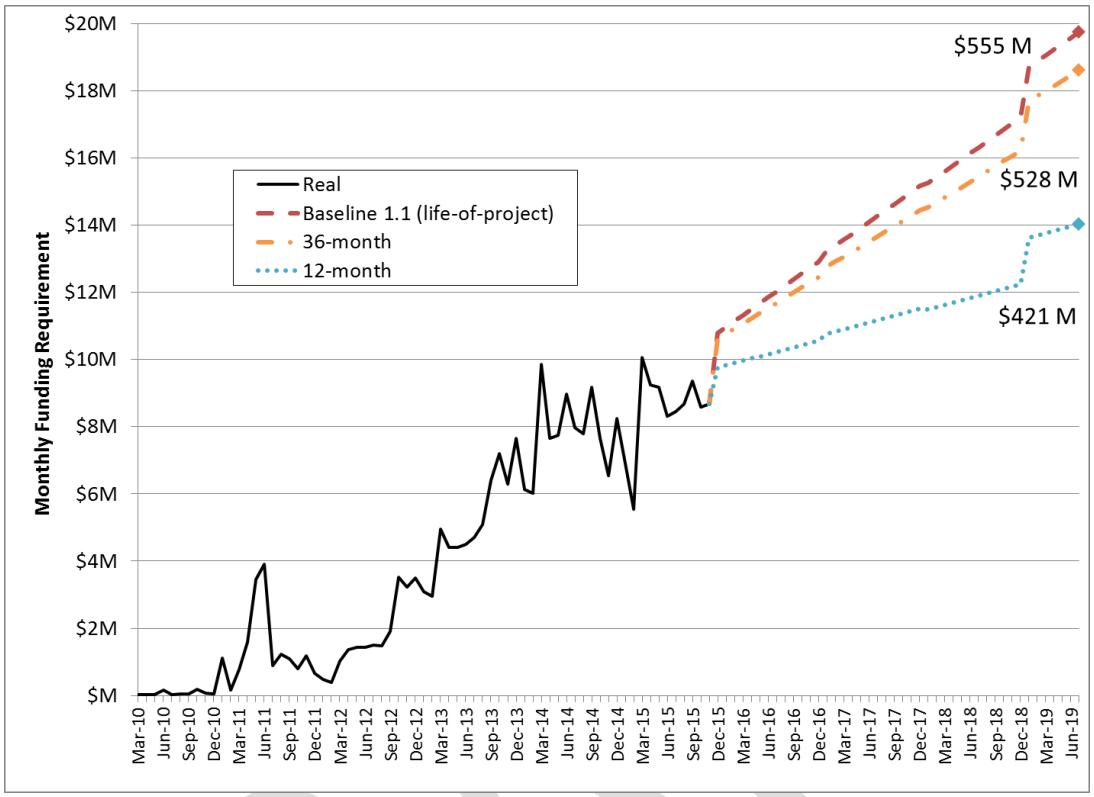

Figure 2: Sensitivity of the Baseline (1.1) to Program Percentage

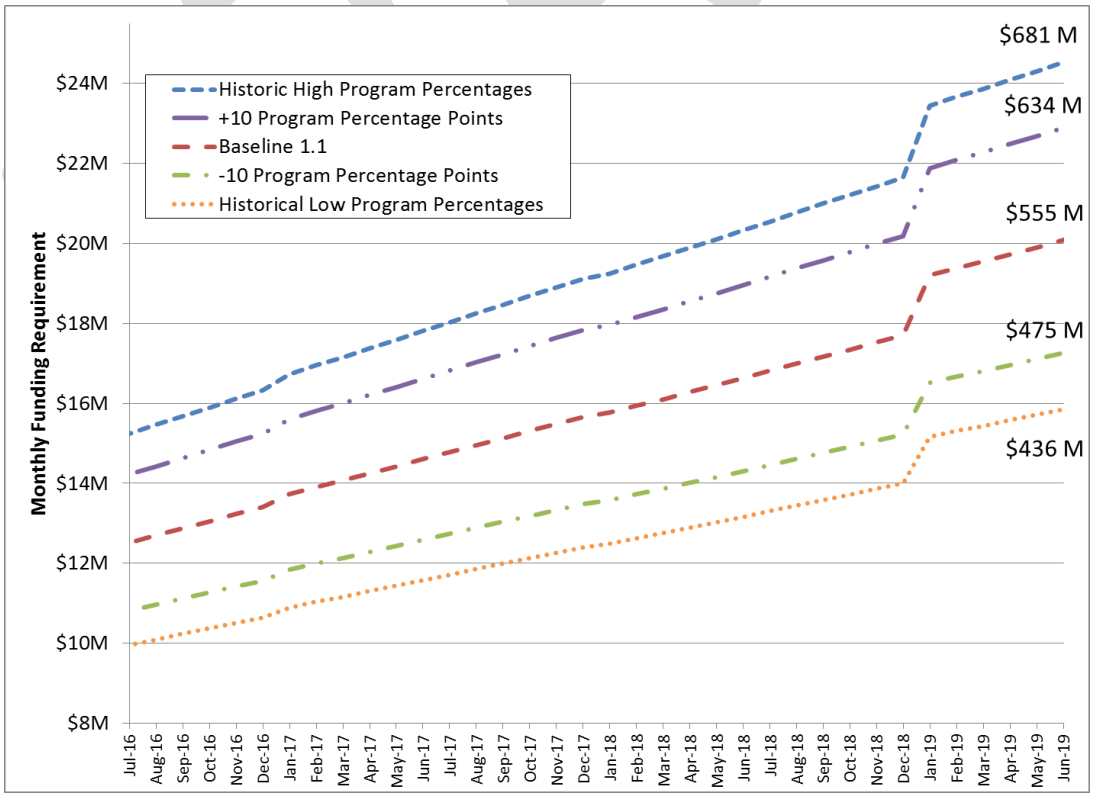

Figure 3: Sensitivity of the Baseline (1.1) to Income Criteria